

169-172 MHz: Under the present rules, wireless microphone use on these 169-172 MHz has been minimal, due to the very narrow allowable occupied bandwidth (54 kHz), which is best used for communications grade audio systems (intercom/cueing), and the fact that out of the eight specific allowable frequencies only a combination of up to three of them can be coordinated for intermodulation-free operation.

The Commission suggests making available as much as possible of the 169-172 MHz band for wireless microphone use on a secondary basis.³⁹ Sennheiser supports this approach. In particular, Sennheiser supports the frequency assignments be changed to allow more frequencies to operate simultaneously. In terms of protection of federal and other users, wireless microphone users have coordinated around other users in the past and are willing to coordinate for these bands as well.

941-960 MHz: Access to the entire 941-960 MHz band is vitally important to the wireless microphone industry, as it is the most attractive alternative to address the loss of UHF spectrum. Increasing the frequency band would approximately double the number of wireless microphones that could be used in this range.

Currently, only certain broadcast entities may operate on 944-952 MHz, which allows for the operation of up to sixteen high performance microphones. Sennheiser supports making the entire 941-960 MHz band available to all entities eligible for a Part 74 license. Sennheiser also supports the proposal to apply the technical rules established for LPAS operations in the 944-952 MHz band, and to adopt the ETSI emission standards.

³⁹ NPRM at ¶ 132.

In terms of whether MAS spectrum could be readily used through leasing arrangements,⁴⁰ in Sennheiser's view this would greatly reduce the number of potential users, as even among Class A users few would have incentive to spend resources to find and negotiate leasing arrangements, given the limited amount of spectrum that could be obtained. Given the extremely low power levels and fairly short range of wireless microphones, Sennheiser believes that according wireless microphone users will not cause interference to MAS licenses. Wireless microphones have co-existed successfully with studio transmitter links for many years, and can co-exist with MAS licensees similarly.

Unlicensed bands (902-928 MHz, 2.4 GHz, and 5 GHz): Sennheiser believes these bands would be appropriate for Class C use, as well as opportunistic use by Class A and Class B users for non-performance links or less critical links.

1920-1930 MHz: This band would be appropriate for Class B use for non-performance links. Sennheiser has already developed systems for unlicensed operation using DECT technology.

1435-1525 MHz: Access to the 1435-1525 MHz band is important for critical wireless microphone use, though is not a substitute for clean UHF spectrum required for hyper-critical, challenging applications (*i.e.* when a second "take" is not an option). Given the high frequency range, the band would not be appropriate for uses such as Broadway performances, where performers must wear small, hidden transmitters and body absorption is more problematic at this frequency range. The frequency band would be more appropriate studio operations or stage performances with handheld (stick) wireless microphones.

⁴⁰ NPRM at ¶ 154.

As the Commission noted, this frequency band is often used on a temporary (STA) basis for large-scale events.⁴¹ Given that Class A licensed, professional users already have shown the ability to successfully work around incumbents, Sennheiser supports authorizing this frequency band for those users, on a secondary basis. Sennheiser notes that it seems promising that 1425-1525 MHz, or at least a large part of it, will become an internationally harmonized band for wireless microphone use, and as such opening the band for greater use in the U.S. would allow for economies of scale in the production of wireless microphone devices.

The Commission proposes limiting use of this frequency band to certain locations and times.⁴² Additionally, the Commission proposes prior coordination to protect incumbent users.⁴³ Sennheiser supports both proposals, although if spectrum is not available during peak performance times, the band will be of limited use. Prior experience shows that these are effective means of providing wireless microphone licensees with access to additional spectrum for large events, while protecting other users.

The Commission questions whether it should require use of an electronic key or other means of controlling access to the spectrum.⁴⁴ Such mechanisms are unnecessary. Class A professional wireless microphone users are experienced at avoiding interference to fixed incumbents (such as TV stations and public safety land mobile communications) without self-location capability, and we expect that success to carry over to the 1.4 GHz band. To ensure professional operation in the band, Sennheiser agrees that use should be limited to Part 74 licensees.

⁴¹ See NPRM at ¶ 176.

⁴² NPRM at ¶ 182.

⁴³ *Id.* at ¶ 183.

⁴⁴ NPRM at ¶ 184.

3.5 GHz: The General Authorized Access (“GAA”) regime for operations on 3.55-3.65 GHz would have limited appeal. Given the high frequency range, use of this band likely would be limited non-professional applications. However, Sennheiser believes that a limited number of certain heavy users, such as on Broadway or the Las Vegas strip, may find this band appealing for use by non-performance links, such as intercom channels.

6875-7125 MHz: The Commission proposes to allow licensed wireless microphone operations on the 6874-7125 MHz band on a secondary basis.⁴⁵ Sennheiser supports access to this frequency band, limited to Class A licensed use. These are portions of a block currently used for video broadcast auxiliary. They have potential for short range broadcast audio applications that are compatible with existing point-to-point operations, such as a reporter with a handheld microphone ten feet in front of a camera. Given the propagation characteristics of this band, other applications would be very limited.

Ultra-wideband: Sennheiser believes the ultra-wide band frequencies would be appropriate for Class B and Class C users for indoor, line of sight applications such as wireless conference systems. While this technology offers tremendous data throughput, it is limited to specific, short range indoor applications.

CONCLUSION

Wireless microphones are vital tools that fuel our economy and are ubiquitous in our society. Major events require up to 350 MHz of total spectrum. The loss of additional UHF spectrum poses great challenges to wireless microphone operators. Sennheiser applauds the

⁴⁵ NPRM at ¶ 197.

Commission for its initiative to accommodate these needs through the allocation of alternative spectrum.

Many wireless microphone applications can be satisfied by operating in bands outside of UHF. However, hyper-critical applications require the use of UHF channels that are clean from out-of-band emissions from adjacent services (and other noise), and are not reliant of the proper operation of white space database system and devices. Given the importance of these uses to our economy, the public interest requires that two UHF reserved blocks should remain designated for wireless microphone use.

The wireless microphone industry has made significant technological advances over the years and has a stellar record of peaceful coexistence with the services that operate in the same bands. The Commission can expect this to continue, without the need for a higher degree of regulation. Simplicity should reign in forming any new regulatory scheme.

Finally, Sennheiser already has been very active in educating the market about the forthcoming transition, and commits further cooperation and resources to help make it as smooth as possible.

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